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# NAVAL POSTGRADUATE SCHOOL

## Monterey, California



USER'S GUIDE TO THE TIME SERIES EDITOR

by

F. Russell Richards

and

Stephen R. Woodall

November 1978

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# USER'S GUIDE TO THE TIME SERIES EDITOR

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## ABSTRACT

This report provides a user's guide to the Time Series Editor, an interactive software package for time series analysis. Data input requirements are explained; the capabilities of the software package are explained; and output options are described. A sample user session is given with actual input and output provided. Error correction and recovery techniques are described.

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## 0. INTRODUCTION

The Time Series Editor is a collection of FORTRAN programs controlled by a master program called TIMESER EXEC in the CP/CMS executive language. The package has been designed for the analysis and forecasting of time series data using the Box-Jenkins modelling methodology. For a complete description of the Time Series Editor, see Richards and Woodall [Ref. 16]. This Guide contains the minimum information that is required for the user to access the Time Series Editor, enter data, build a model, evaluate the model, forecast, and obtain output.

## I. DATA INPUT

The Time Series Editor requires that time series data be entered into the sequential FORTRAN input/output file named FILE FT02F001. This can be done either online or via cards read offline. The following page shows the proper card deck arrangement for reading data offline. The data deck must be given to the computer center system operator for entry into CP.

If the user has a data deck already punched up in a format other than 5F15.6, he may enter the series as above into FILE FT03F001 (without the length of series card) and use the Editor program ZFORMAT to transform it into the FILE FT02F001 in the proper format, without destroying his original file. This program is described in the next section.

# DATA ENTRY DECK

time saver data deck  
in FORMAT (5F15.6)

length of series in  
FORMAT (I3)  
(omit for ZFORMAT  
program)

OFFLINE READ FILE FT02F001

CP87USERID 1621P

26.5 26.7 26.9 27.1 27.3 27.5 27.7 27.9 28.1 28.3 28.5 28.7 28.9 29.1 29.3 29.5 29.7 29.9 30.1 30.3 30.5 30.7 30.9 31.1 31.3 31.5 31.7 31.9 32.1 32.3 32.5 32.7 32.9 33.1 33.3 33.5 33.7 33.9 34.1 34.3 34.5 34.7 34.9 35.1 35.3 35.5 35.7 35.9 36.1 36.3 36.5 36.7 36.9 37.1 37.3 37.5 37.7 37.9 38.1 38.3 38.5 38.7 38.9 39.1 39.3 39.5 39.7 39.9 40.1 40.3 40.5 40.7 40.9 41.1 41.3 41.5 41.7 41.9 42.1 42.3 42.5 42.7 42.9 43.1 43.3 43.5 43.7 43.9 44.1 44.3 44.5 44.7 44.9 45.1 45.3 45.5 45.7 45.9 46.1 46.3 46.5 46.7 46.9 47.1 47.3 47.5 47.7 47.9 48.1 48.3 48.5 48.7 48.9 49.1 49.3 49.5 49.7 49.9 50.1 50.3 50.5 50.7 50.9 51.1 51.3 51.5 51.7 51.9 52.1 52.3 52.5 52.7 52.9 53.1 53.3 53.5 53.7 53.9 54.1 54.3 54.5 54.7 54.9 55.1 55.3 55.5 55.7 55.9 56.1 56.3 56.5 56.7 56.9 57.1 57.3 57.5 57.7 57.9 58.1 58.3 58.5 58.7 58.9 59.1 59.3 59.5 59.7 59.9 60.1 60.3 60.5 60.7 60.9 61.1 61.3 61.5 61.7 61.9 62.1 62.3 62.5 62.7 62.9 63.1 63.3 63.5 63.7 63.9 64.1 64.3 64.5 64.7 64.9 65.1 65.3 65.5 65.7 65.9 66.1 66.3 66.5 66.7 66.9 67.1 67.3 67.5 67.7 67.9 68.1 68.3 68.5 68.7 68.9 69.1 69.3 69.5 69.7 69.9 70.1 70.3 70.5 70.7 70.9 71.1 71.3 71.5 71.7 71.9 72.1 72.3 72.5 72.7 72.9 73.1 73.3 73.5 73.7 73.9 74.1 74.3 74.5 74.7 74.9 75.1 75.3 75.5 75.7 75.9 76.1 76.3 76.5 76.7 76.9 77.1 77.3 77.5 77.7 77.9 78.1 78.3 78.5 78.7 78.9 79.1 79.3 79.5 79.7 79.9 80.1 80.3 80.5 80.7 80.9 81.1 81.3 81.5 81.7 81.9 82.1 82.3 82.5 82.7 82.9 83.1 83.3 83.5 83.7 83.9 84.1 84.3 84.5 84.7 84.9 85.1 85.3 85.5 85.7 85.9 86.1 86.3 86.5 86.7 86.9 87.1 87.3 87.5 87.7 87.9 88.1 88.3 88.5 88.7 88.9 89.1 89.3 89.5 89.7 89.9 90.1 90.3 90.5 90.7 90.9 91.1 91.3 91.5 91.7 91.9 92.1 92.3 92.5 92.7 92.9 93.1 93.3 93.5 93.7 93.9 94.1 94.3 94.5 94.7 94.9 95.1 95.3 95.5 95.7 95.9 96.1 96.3 96.5 96.7 96.9 97.1 97.3 97.5 97.7 97.9 98.1 98.3 98.5 98.7 98.9 99.1 99.3 99.5 99.7 99.9 100.1 100.3 100.5 100.7 100.9 101.1 101.3 101.5 101.7 101.9 102.1 102.3 102.5 102.7 102.9 103.1 103.3 103.5 103.7 103.9 104.1 104.3 104.5 104.7 104.9 105.1 105.3 105.5 105.7 105.9 106.1 106.3 106.5 106.7 106.9 107.1 107.3 107.5 107.7 107.9 108.1 108.3 108.5 108.7 108.9 109.1 109.3 109.5 109.7 109.9 110.1 110.3 110.5 110.7 110.9 111.1 111.3 111.5 111.7 111.9 112.1 112.3 112.5 112.7 112.9 113.1 113.3 113.5 113.7 113.9 114.1 114.3 114.5 114.7 114.9 115.1 115.3 115.5 115.7 115.9 116.1 116.3 116.5 116.7 116.9 117.1 117.3 117.5 117.7 117.9 118.1 118.3 118.5 118.7 118.9 119.1 119.3 119.5 119.7 119.9 120.1 120.3 120.5 120.7 120.9 121.1 121.3 121.5 121.7 121.9 122.1 122.3 122.5 122.7 122.9 123.1 123.3 123.5 123.7 123.9 124.1 124.3 124.5 124.7 124.9 125.1 125.3 125.5 125.7 125.9 126.1 126.3 126.5 126.7 126.9 127.1 127.3 127.5 127.7 127.9 128.1 128.3 128.5 128.7 128.9 129.1 129.3 129.5 129.7 129.9 130.1 130.3 130.5 130.7 130.9 131.1 131.3 131.5 131.7 131.9 132.1 132.3 132.5 132.7 132.9 133.1 133.3 133.5 133.7 133.9 134.1 134.3 134.5 134.7 134.9 135.1 135.3 135.5 135.7 135.9 136.1 136.3 136.5 136.7 136.9 137.1 137.3 137.5 137.7 137.9 138.1 138.3 138.5 138.7 138.9 139.1 139.3 139.5 139.7 139.9 140.1 140.3 140.5 140.7 140.9 141.1 141.3 141.5 141.7 141.9 142.1 142.3 142.5 142.7 142.9 143.1 143.3 143.5 143.7 143.9 144.1 144.3 144.5 144.7 144.9 145.1 145.3 145.5 145.7 145.9 146.1 146.3 146.5 146.7 146.9 147.1 147.3 147.5 147.7 147.9 148.1 148.3 148.5 148.7 148.9 149.1 149.3 149.5 149.7 149.9 150.1 150.3 150.5 150.7 150.9 151.1 151.3 151.5 151.7 151.9 152.1 152.3 152.5 152.7 152.9 153.1 153.3 153.5 153.7 153.9 154.1 154.3 154.5 154.7 154.9 155.1 155.3 155.5 155.7 155.9 156.1 156.3 156.5 156.7 156.9 157.1 157.3 157.5 157.7 157.9 158.1 158.3 158.5 158.7 158.9 159.1 159.3 159.5 159.7 159.9 160.1 160.3 160.5 160.7 160.9 161.1 161.3 161.5 161.7 161.9 162.1 162.3 162.5 162.7 162.9 163.1 163.3 163.5 163.7 163.9 164.1 164.3 164.5 164.7 164.9 165.1 165.3 165.5 165.7 165.9 166.1 166.3 166.5 166.7 166.9 167.1 167.3 167.5 167.7 167.9 168.1 168.3 168.5 168.7 168.9 169.1 169.3 169.5 169.7 169.9 170.1 170.3 170.5 170.7 170.9 171.1 171.3 171.5 171.7 171.9 172.1 172.3 172.5 172.7 172.9 173.1 173.3 173.5 173.7 173.9 174.1 174.3 174.5 174.7 174.9 175.1 175.3 175.5 175.7 175.9 176.1 176.3 176.5 176.7 176.9 177.1 177.3 177.5 177.7 177.9 178.1 178.3 178.5 178.7 178.9 179.1 179.3 179.5 179.7 179.9 180.1 180.3 180.5 180.7 180.9 181.1 181.3 181.5 181.7 181.9 182.1 182.3 182.5 182.7 182.9 183.1 183.3 183.5 183.7 183.9 184.1 184.3 184.5 184.7 184.9 185.1 185.3 185.5 185.7 185.9 186.1 186.3 186.5 186.7 186.9 187.1 187.3 187.5 187.7 187.9 188.1 188.3 188.5 188.7 188.9 189.1 189.3 189.5 189.7 189.9 190.1 190.3 190.5 190.7 190.9 191.1 191.3 191.5 191.7 191.9 192.1 192.3 192.5 192.7 192.9 193.1 193.3 193.5 193.7 193.9 194.1 194.3 194.5 194.7 194.9 195.1 195.3 195.5 195.7 195.9 196.1 196.3 196.5 196.7 196.9 197.1 197.3 197.5 197.7 197.9 198.1 198.3 198.5 198.7 198.9 199.1 199.3 199.5 199.7 199.9 200.1 200.3 200.5 200.7 200.9 201.1 201.3 201.5 201.7 201.9 202.1 202.3 202.5 202.7 202.9 203.1 203.3 203.5 203.7 203.9 204.1 204.3 204.5 204.7 204.9 205.1 205.3 205.5 205.7 205.9 206.1 206.3 206.5 206.7 206.9 207.1 207.3 207.5 207.7 207.9 208.1 208.3 208.5 208.7 208.9 209.1 209.3 209.5 209.7 209.9 210.1 210.3 210.5 210.7 210.9 211.1 211.3 211.5 211.7 211.9 212.1 212.3 212.5 212.7 212.9 213.1 213.3 213.5 213.7 213.9 214.1 214.3 214.5 214.7 214.9 215.1 215.3 215.5 215.7 215.9 216.1 216.3 216.5 216.7 216.9 217.1 217.3 217.5 217.7 217.9 218.1 218.3 218.5 218.7 218.9 219.1 219.3 219.5 219.7 219.9 220.1 220.3 220.5 220.7 220.9 221.1 221.3 221.5 221.7 221.9 222.1 222.3 222.5 222.7 222.9 223.1 223.3 223.5 223.7 223.9 224.1 224.3 224.5 224.7 224.9 225.1 225.3 225.5 225.7 225.9 226.1 226.3 226.5 226.7 226.9 227.1 227.3 227.5 227.7 227.9 228.1 228.3 228.5 228.7 228.9 229.1 229.3 229.5 229.7 229.9 230.1 230.3 230.5 230.7 230.9 231.1 231.3 231.5 231.7 231.9 232.1 232.3 232.5 232.7 232.9 233.1 233.3 233.5 233.7 233.9 234.1 234.3 234.5 234.7 234.9 235.1 235.3 235.5 235.7 235.9 236.1 236.3 236.5 236.7 236.9 237.1 237.3 237.5 237.7 237.9 238.1 238.3 238.5 238.7 238.9 239.1 239.3 239.5 239.7 239.9 240.1 240.3 240.5 240.7 240.9 241.1 241.3 241.5 241.7 241.9 242.1 242.3 242.5 242.7 242.9 243.1 243.3 243.5 243.7 243.9 244.1 244.3 244.5 244.7 244.9 245.1 245.3 245.5 245.7 245.9 246.1 246.3 246.5 246.7 246.9 247.1 247.3 247.5 247.7 247.9 248.1 248.3 248.5 248.7 248.9 249.1 249.3 249.5 249.7 249.9 250.1 250.3 250.5 250.7 250.9 251.1 251.3 251.5 251.7 251.9 252.1 252.3 252.5 252.7 252.9 253.1 253.3 253.5 253.7 253.9 254.1 254.3 254.5 254.7 254.9 255.1 255.3 255.5 255.7 255.9 256.1 256.3 256.5 256.7 256.9 257.1 257.3 257.5 257.7 257.9 258.1 258.3 258.5 258.7 258.9 259.1 259.3 259.5 259.7 259.9 260.1 260.3 260.5 260.7 260.9 261.1 261.3 261.5 261.7 261.9 262.1 262.3 262.5 262.7 262.9 263.1 263.3 263.5 263.7 263.9 264.1 264.3 264.5 264.7 264.9 265.1 265.3 265.5 265.7 265.9 266.1 266.3 266.5 266.7 266.9 267.1 267.3 267.5 267.7 267.9 268.1 268.3 268.5 268.7 268.9 269.1 269.3 269.5 269.7 269.9 270.1 270.3 270.5 270.7 270.9 271.1 271.3 271.5 271.7 271.9 272.1 272.3 272.5 272.7 272.9 273.1 273.3 273.5 273.7 273.9 274.1 274.3 274.5 274.7 274.9 275.1 275.3 275.5 275.7 275.9 276.1 276.3 276.5 276.7 276.9 277.1 277.3 277.5 277.7 277.9 278.1 278.3 278.5 278.7 278.9 279.1 279.3 279.5 279.7 279.9 280.1 280.3 280.5 280.7 280.9 281.1 281.3 281.5 281.7 281.9 282.1 282.3 282.5 282.7 282.9 283.1 283.3 283.5 283.7 283.9 284.1 284.3 284.5 284.7 284.9 285.1 285.3 285.5 285.7 285.9 286.1 286.3 286.5 286.7 286.9 287.1 287.3 287.5 287.7 287.9 288.1 288.3 288.5 288.7 288.9 289.1 289.3 289.5 289.7 289.9 290.1 290.3 290.5 290.7 290.9 291.1 291.3 291.5 291.7 291.9 292.1 292.3 292.5 292.7 292.9 293.1 293.3 293.5 293.7 293.9 294.1 294.3 294.5 294.7 294.9 295.1 295.3 295.5 295.7 295.9 296.1 296.3 296.5 296.7 296.9 297.1 297.3 297.5 297.7 297.9 298.1 298.3 298.5 298.7 298.9 299.1 299.3 299.5 299.7 299.9 300.1 300.3 300.5 300.7 300.9 301.1 301.3 301.5 301.7 301.9 302.1 302.3 302.5 302.7 302.9 303.1 303.3 303.5 303.7 303.9 304.1 304.3 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337.7 337.9 338.1 338.3 338.5 338.7 338.9 339.1 339.3 339.5 339.7 339.9 340.1 340.3 340.5 340.7 340.9 341.1 341.3 341.5 341.7 341.9 342.1 342.3 342.5 342.7 342.9 343.1 343.3 343.5 343.7 343.9 344.1 344.3 344.5 344.7 344.9 345.1 345.3 345.5 345.7 345.9 346.1 346.3 346.5 346.7 346.9 347.1 347.3 347.5 347.7 347.9 348.1 348.3 348.5 348.7 348.9 349.1 349.3 349.5 349.7 349.9 350.1 350.3 350.5 350.7 350.9 351.1 351.3 351.5 351.7 351.9 352.1 352.3 352.5 352.7 352.9 353.1 353.3 353.5 353.7 353.9 354.1 354.3 354.5 354.7 354.9 355.1 355.3 355.5 355.7 355.9 356.1 356.3 356.5 356.7 356.9 357.1 357.3 357.5 357.7 357.9 358.1 358.3 358.5 358.7 358.9 359.1 359.3 359.5 359.7 359.9 360.1 360.3 360.5 360.7 360.9 361.1 361.3 361.5 361.7 361.9 362.1 362.3 362.5 362.7 362.9 363.1 363.3 363.5 363.7 363.9 364.1 364.3 364.5 364.7 364.9 365.1 365.3 365.5 365.7 365.9 366.1 366.3 366.5 366.7 366.9 367.1 367.3 367.5 367.7 367.9 368.1 368.3 368.5 368.7 368.9 369.1 369.3 369.5 369.7 369.9 370.1 370.3 370.5 370.7 370.9 371.1 371.3 371.5 371.7 371.9 372.1 372.3 372.5 372.7 372.9 373.1 373.3 373.5 373.7 373.9 374.1 374.3 374.5 374.7 374.9 375.1 375.3 375.5 375.7 375.9 376.1 376.3 376.5 376.7 376.9 377.1 377.3 377.5 377.7 377.9 378.1 378.3 378.5 378.7 378.9 379.1 379.3 379.5 379.7 379.9 380.1 380.3 380.5 380.7 380.9 381.1 381.3 381.5 381.7 381.9 382.1 382.3 382.5 382.7 382.9 383.1 383.3 383.5 383.7 383.9 384.1 384.3 384.5 384.7 384.9 385.1 385.3 385.5 385.7 385.9 386.1 386.3 386.5 386.7 386.9 387.1 387.3 387.5 387.7 387.9 388.1 388.3 388.5 388.7 388.9 389.1 389.3 389.5 389.7 389.9 390.1 390.3 390.5 390.7 390.9 391.1 391.3 391.5 391.7 391.9 392.1 392.3 392.5 392.7 392.9 393.1 393.3 393.5 393.7 393.9 394.1 394.3 394.5 394.7 394.9 395.1 395.3 395.5 395.7 395.9 396.1 396.3 396.5 396.7 396.9 397.1 397.3 397.5 397.7 397.9 398.1 398.3 398.5 398.7 398.9 399.1 399.3 399.5 399.7 399.9 400.1 400.3 400.5 400.7 400.9 401.1 401.3 401.5 401.7 401.9 402.1 402.3 402.5 402.7 402.9 403.1 403.3 403.5 403.7 403.9 404.1 404.3 404.5 404.7 404.9 405.1 405.3 405.5 405.7 405.9 406.1 406.3 406.5 406.7 406.9 407.1 407.3 407.5 407.7 407.9 408.1 408.3 408.5 408.7 408.9 409.1 409.3 409.5 409.7 409.9 410.1 410.3 410.5 410.7 410.9 411.1 411.3 411.5 411.7 411.9 412.1 412.3 412.5 412.7 412.9 413.1 413.3 413.5 413.7 413.9 414.1 414.3 414.5 414.7 414.9 415.1 415.3 415.5 415.7 415.9 416.1 416.3 416.5 416.7 416.9 417.1 417.3 417.5 417.7 417.9 418.1 418.3 418.5 418.7 418.9 419.1 419.3 419.5 419.7 419.9 420.1 420.3 420.5 420.7 420.9 421.1 421.3 421.5 421.7 421.9 422.1 422.3 422.5 422.7 422.9 423.1 423.3 423.5 423.7 423.9 424.1 424.3 424.5 424.7 424.9 425.1 425.3 425.5 425.7 425.9 426.1 426.3 426.5 426.7 426.9 427.1 427.3 427.5 427.7 427.9 428.1 428.3 428.5 428.7 428.9 429.1 429.3 429.5 429.7 429.9 430.1 430.3 430.5 430.7 430.9 431.1 431.3 431.5 431.7 431.9 432.1 432.3 432.5 432.7 432.9 433.1 433.3 433.5 433.7 433.9 434.1 434.3 434.5 434.7 434.9 435.1 435.3 435.5 435.7 435.9 436.1 436.3 436.5 436.7 436.9 437.1 437.3 437.5 437.7 437.9 438.1 438.3 438.5 438.7 438.9 439.1 439.3 439.5 439.7 439.9 440.1 440.3 440.5 440.7 440.9 441.1 441.3 441.5 441.7 441.9 442.1 442.3 442.5 442.7 442.9 443.1 443.3 443.5 443.7 443.9 444.1 44



## II. TABLE OF OPTIONS

This Table provides the user with the basic information necessary to understand the data requirements, functions and output options for each program in the Editor.

PROGRAM	INPUT	OUTPUT	REMARKS
Name: ZFORMAT Entry Code: z	<p>Files: (1) data in FILE FT03F001</p> <p>Keyboard: (1) length of time series (2) format of time series</p>	<p>Files: (1) original data put in FORMAT(5F15.6) in FILE FT02F001 (2) original data unchanged in FILE FT03F001</p>	<p>(1) puts date into proper format for Time Series Editor (2) single precision</p>
Name: CMSWORK Entry Code: C	<p>no specific input; normal usage would include file name alteration, obtaining disc status, or erasing files no longer required</p>	<p>no specific output</p>	<p>(1) allows users to perform CMS admin actions while in TIMESER environment</p>
Name: TRANS Entry Code: T	<p>Files: (1) data in FILE FT02F001</p> <p>Keyboard: (1) origin transformation? (2) scale change factor? (3) log transform? (4) power/root transform?</p>	<p>Files: (1) original data unchanged in DATA FT02F001 (2) transformed data in FILE FT02F001 (3) transformation parameters in FILE FT07F001</p>	<p>(1) allows user to transform data in a file (2) single precision</p>

PROGRAM	INPUT	OUTPUT	REMARKS
Name: DIFF Entry Code: D	Files: (1) original (transformed if desired) series in FILE FT02F001 Keyboard: (1) series seasonal? (2) number of non- seasonal differences (3) number of seasonal differences (4) length of seasonal period	Files: (1) original series unchanged in FILE FT02F001 (2) differenced series in FILE FT03F001	(1) allows user to perform differencing of a time series, in order to achieve series stationarity (2) uses IMSL subroutine FTRDIF (3) single precision
Name: PLOT Entry Code: P	Files: (1) original series in FILE FT02F001 Keyboard: (1) title for plot	Files: (1) original series unchanged in FILE FT02F001 Offline: (1) plot of time series	(1) allows user to plot any time series using offline printer (2) uses SSPLIB routine PLOT8 (3) single precision

# PROGRAM

## INPUT

## OUTPUT

## REMARKS

Name: AUTO

Entry Code: A

### Files:

- (1) original series in FILE FT02F001 transformed and/or differenced if desired

### Keyboard:

- (1) number of autos/pautos to be calculated
- (2) title for plots of autos/pautos

### Files:

- (1) original series unchanged in FILE FT02F001
- (2) plots of autos/pautos in FILE FT08F001

### Terminal:

- (1) values of autos and pautos
- (2) mean
- (3) variance

### Offline:

- (1) plots of autos and pautos

- (1) allows user to obtain basic statistics for time series
- (2) uses IMSL subroutine FTAUTO, as well as UTPLT8 routine
- (3) single precision

Name: ESTIMATE

Entry Code: E

### Files:

- (1) original series in FILE FT02F001; transformed and/or differenced as desired.

### Keyboard:

- (1) number of AR parameters
- (2) number of MA parameters
- (3) number of (non-seasonal) differences to be taken, if series not already differenced
- (4) titles for plots of residual autos and pautos

### Files:

- (1) original series unchanged in FILE FT02F001
- (2) model residuals in FILE FT02F001

### Terminal:

- (1) estimated AR parameters
- (2) estimated MA parameters
- (3) MA constant
- (4) residual variance
- (5) portmanteau test of residuals

### Offline:

- (1) plots of residual autos and pautos

- (1) allows user to obtain maximum likelihood parameter estimates for a general non-seasonal ARIMA model, as well as data concerning model sufficiency
- (2) uses IMSL subroutine FTMATL
- (3) single precision

PROGRAM	INPUT	OUTPUT	REMARKS
Name: YESTSEAS Entry Code: Y	<p>Files:</p> <p>(1) original series in FILE FT02F001 transformed if desired; and either differenced or undifferenced</p> <p>Keyboad:</p> <p>(1) number of seasonal and non-seasonal differences to be taken</p> <p>(2) length of seasonal period</p> <p>(3) numbers of both seasonal and non-seasonal AR and MA parameters</p>	<p>Files:</p> <p>(1) original series unchanged in FILE FT02F001</p> <p>Terminal:</p> <p>(1) estimated values for requested seasonal and non-seasonal AR and MA parameters</p>	<p>(1) allows user to calculate initial non-seasonal and seasonal ARIMA model parameter estimates as input to WVARQRTD routine</p> <p>(2) uses IMSL subroutines FTRDIF, FTMAXL, FTAUTO, FTARPS and FTMAPS</p> <p>(3) single precision</p>
Name: WVARQRTD Entry Code: W	<p>Files:</p> <p>(1) original series in FILE FT02F001; may be transformed but not differenced (either diff or nondiff)</p> <p>Keyboad:</p> <p>(1) number of seasonal and non-seasonal differences to be taken</p> <p>(2) length of seasonal period</p>	<p>Files:</p> <p>(1) original series unchanged in FILE FT02F001</p> <p>Terminal:</p> <p>(1) seasonal and non-seasonal AR and MA parameter estimates</p> <p>(2) parameter standard errors</p> <p>(3) MA constant term</p> <p>(4) sum of squared residuals</p> <p>(5) residual variance</p>	<p>(1) allows user to estimate non-linear least squares parameters for a general seasonal Box-Jenkins ARIMA model</p> <p>(2) requires initial parameter estimates, obtainable using YESTSEAS program</p> <p>(3) uses IMSL subroutines FTRDIF, FTAUTO, LINVLF, and MDCDFI, SSPLIB routine DPLOT, and Time Series Editor resident subroutine PARSH, VARQRT, SUMSQ, SWAPB and FORMB</p>

PROGRAM	INPUT	OUTPUT	REMARKS
Name: WMAPQRDT (CONTINUED)	(3) number and initial estimates of seasonal and non-seasonal AR and MA parameters	(6) residual variance (7) portmanteau test for model goodness-of-fit Offline: (1) plots of autos/pautos of residuals	(4) double precision (5) requires LOGIN with 450k core (6) if non-seasonal modeling, input length of season = 1
Name: XSUMSQ Entry Code: X	Files: (1) original series in FILE FT02F001; should be transformed and/or differenced as desired Keyboard: (1) number and estimates of seasonal and non-seasonal AR and MA parameters (2) length of seasonal period	Files: (1) original series unchanged in FILE FT02F001 Terminal: (1) value of residual sum of squares for the model and parameters specified	(1) allows user to obtain a residual sum of squares value for any seasonal or non-seasonal ARIMA model with specified parameters (2) uses Time Series Editor resident subroutine SUMSQ (3) double precision
Name: FORECAST Entry Code: F	Files: (1) original series in FILE FT02F001; transformed as desired, but not differenced Keyboard: (1) number of seasonal and non-seasonal differences to be taken	Files: (1) original series unchanged in FILE FT02F001 (2) forecast values and plot FILE FT08F001	(1) allows the user to forecast any seasonal or non-seasonal time series using a previously determined seasonal or non-seasonal ARIMA model and the time series itself

PROGRAM	INPUT	OUTPUT	REMARKS
Name: FORECAST (CONTINUED)	<p>(2) length of seasonal period</p> <p>(3) number and estimated values of seasonal and non-seasonal AR and MA parameters</p> <p>(4) MA constant</p> <p>(5) index for forecast origin</p> <p>(6) maximum forecast lead time</p> <p>(7) index for plot origin</p> <p>(8) confidence level for forecast confidence units</p>	<p>Offline:</p> <p>(1) plot of forecast of series, including listing of forecast values and confidence interval values</p>	<p>(2) uses IMSL subroutine FTRDLF and modified SSPLTB routine</p> <p>UTPLOT called</p> <p>UTPLT8</p> <p>(3) single precision</p>
Name: ROOTS Entry Code: R	<p>Keyboard:</p> <p>(1) number of AR parameters in undifferenced form</p> <p>(2) values of AR parameters</p>	<p>Terminal:</p> <p>(1) values of roots</p>	<p>(1) allows user to calculate the roots of the characteristic equation for non-seasonal ARIMA models</p> <p>(2) uses IMSL routine ZPOLR</p> <p>(3) single precision</p>
Name: HELP Entry Code: H	None	None	<p>(1) allows user to access program information paragraphs after the TIMESER introduction phase has been completed</p>



PROGRAM	INPUT	OUTPUT	REMARKS
Name: GENERATE Entry Code: G	<p>Keyboard:</p> <ul style="list-style-type: none"> <li>(1) random number seed</li> <li>(2) number and values for non-seasonal AR and MA ARIMA model parameters</li> <li>(3) MA constant term</li> <li>(4) residual variance</li> <li>(5) length of series to be generated</li> <li>(6) initial starting value for time series to be generated</li> </ul>	<p>Files:</p> <ul style="list-style-type: none"> <li>(1) generated time series written onto FILE FT02F001</li> </ul> <p>Offline:</p> <ul style="list-style-type: none"> <li>(1) length of generated series and series values themselves are printed offline</li> </ul>	<ul style="list-style-type: none"> <li>(1) allows the user to generate a time series from a given non-seasonal ARIMA model, previously determined</li> <li>(2) uses IMSL subroutine FTGEN1</li> <li>(3) single precision</li> </ul>
Name: SIMULATE Entry Code: S	<p>Files:</p> <ul style="list-style-type: none"> <li>(1) original series in FILE FT02F001, transformed and/or differenced as desired</li> </ul> <p>Keyboard:</p> <ul style="list-style-type: none"> <li>(1) number and values for non-seasonal AR and MA ARIMA model parameters</li> <li>(2) MA constant term</li> <li>(3) residual variance</li> <li>(4) index value of time series where simulation is to begin</li> <li>(5) starting values of series to be simulated</li> <li>(6) random number seed</li> <li>(7) number of values to be simulated in each series</li> <li>(8) number of series to</li> </ul>	<p>Files:</p> <ul style="list-style-type: none"> <li>(1) original series unchanged in FILE FT02F001 Terminal:</li> <li>(1) Simulated series</li> </ul>	<ul style="list-style-type: none"> <li>(1) allows user to produce any number of simulated time series from a given non-seasonal ARIMA model</li> <li>(2) uses IMSL subroutine FTGEN1</li> <li>(3) single precision</li> </ul>



### III. THE BASIC USER SESSION

To use the Time Series Editor, the user must log into CMS, get into CP, link to the disc storage area where the Time Series Editor resides, reimplement CMS, log into the general user and Time Series Editor disc areas, and enter the TIMESER routine. This section will provide explicit guidelines to enable the user to perform the above steps on the NPS CP/CMS system. Commands marked with an asterisk (\*) are those actually entered on the terminal by the user (the asterisk itself is omitted). Those without an asterisk and those written in all capital letters are system responses at the terminal. Numbered sentences are comments, which will not appear during an actual user session. The instructions and system responses assure the user is on an IBM 2741 Input/Output Terminal. Some minor modifications may be necessary if other terminals are used.

1. Turn the terminal on, depress the BREAK key, and wait for the system to respond:

CP-67 online xd.65 gsyosu

2. Depress the ATTN key. The roll bar will advance and the keyboard will unlock. Then enter:

\*login aaaapbb 450k

3. aaaa is the user's identification number, and nn is the terminal number (usually written on the terminal). For example, if the user's ID number is 1621 and the terminal number is 44, the input would be:  
login 1621p44 450k. The addition of 450 k to the normal login command is necessary to execute the program WMARQRDT in the Editor; for users not planning to execute this program during a session, this addition is not necessary.

4. The system will respond with the statement:  
ENTER PASSWORD:
5. The user then enters his password, or the general users password npg;  
\*password
6. The system will then respond:  
ENTER 4-DIGIT PROJECT NUMBER FOLLOWED BY 4-CHARACTER  
COST CENTER CODE:
7. The user then enters:  
\*ggggghhhh
8. gggg is the assigned project number, and hhhh is the user's section designator or the faculty code.
9. The system will respond with the message of the day, such as:  
  
CP/CMS HOURS ... 0930=2200 (MON-THURS) ... 0930-1800 (FRI)  
OUTPUT RETAINED 5 DAYS  
Cms Version 3.25
10. At this point, the user is in CMS. He must then get into CP; this can be done by hitting the ATTN key. The system will then respond:  
  
CP
11. The user must then link to the TIME SERIES EDITOR; this is accomplished by entering:  
  
\*link 2069p 191 192
12. The system will respond with:  
  
ENTER PASSWORD:
13. The password (read only) to enter the Editor is:  
  
\*timser
14. The system then responds:  
  
SET TO READ ONLY

15. The user now implements CMS by:
- ```
*ipl cms
```
16. The system will respond:
- ```
CMS Version 3.25
```
17. Now the user must log into both the general user and the Time Series Editor area by entering:
- ```
*login 191
```
18. The system will respond with a message such as:
- ```
R;
```
19. The user then enters the command:
- ```
*login 192 t,p
```
20. The system will respond:
- ```
T (192) R/O  
R;
```
21. The user can then enter the Time Series Editor (guided version) by entering the command:
- ```
*timeser
```
22. The system will respond:
- ```
EACH 2 SECONDS EXECUTION TIME IS INDICATED BY *  
  
YOU HAVE ENTERED THE TIME SERIES EDITOR  
  
PLEASE RESPOND TO EACH QUERY WITH AN INPUT AT THE TERMINAL.  
ENTER ONLY THE FIRST LETTER FOR A WORD RESPONSE.  
ENTER NUMERICAL VALUES VIA FORTRAN FORMAT.  
  
TYPE INTEGER VALUES (RIGHT JUSTIFIED) FOR NAMES STARTING  
WITH I THROUGH N. TYPE FLOATING VALUES WITH DECIMAL FOR  
ALL OTHERS.  
  
DO YOU WANT A LIST OF THE OPTIONS?
```
23. The user is then on his own, guided by the Exec routine. See the notes that appear at the end of this guide for additional information. Eventually the user will be asked:
- ```
DO YOU WANT TO TRY AGAIN?
```

24. If a yes response is given, another sequence will begin; if the response is no, the user will be taken out of the Time Series Editor environment and returned to CMS. The system response will be:

CONTROL RETURNED TO CMS  
R;

25. The user can then log out of CMS by typing:

\*cp logout

26. The system will respond with:

CONNECT= 00:08:02 VIRTCPU= 000:07.98 TOTCPU= 000.10.94  
LOGOUT AT 14.22.04 on 10/16/78

27. The user should then turn off his terminal and tear off the output from his session.

The more experienced user can dispense with the "welcome aboard" section of the Time Series Editor and get right down to business by using the shortened version of the Editor. This shortened version may be entered by linking in the normal way, and then entering the Editor by typing the COMMAND

\*timeser s (asterisk omitted).

The system will immediately respond:

ENTER LETTER FOR OPTION YOU WANT.

The session inside the Editor then begins.

#### IV. BRIEF SAMPLE USER SESSION

A brief sample user session is given below; it includes copies of the offline output generated during the session.

repeat login nur@pn@

login 162lp44 450k  
ENTER PASSWORD:

ENTER 4-DIGIT, PROJECT NUMBER FOLLOWED BY 4-CHARACTER COST CENTER CODE:  
0444r172  
READY AT 17.24.38 ON 09/16/78  
CMS Version 3.25

stat  
P (191): 29 FILES; 241 REC IN USE, 55 LEFT (of 296), 83% FULL (2 CYL)  
R;  
cp q f  
FILES:- NO RDR, NO PRT, NO PUN  
R;  
CP  
link 2069p 191 192  
ENTER PASSWORD:

SET TO READ ONLY

ipl cms  
CMS Version 3.25

login 191  
R;  
login 192 t,p  
T (192) R/O  
R;

timeser  
EACH 2 SECONDS EXECUTION TIME IS INDICATED BY \*.

YOU HAVE ENTERED THE TIME SERIES EDITOR.

PLEASE RESPOND TO EACH QUERY WITH AN INPUT AT THE TERMINAL.  
ENTER ONLY THE FIRST LETTER FOR A WORD RESPONSE.  
ENTER NUMERICAL VALUES VIA FORTRAN FORMAT.

TYPE INTEGER VALUES (RIGHT JUSTIFIED) FOR NAMES STARTING  
WITH I THRU N. TYPE FLOATING VALUES WITH DECIMAL FOR ALL OTHERS.

DO YOU WANT A LIST OF THE OPTIONS?  
Y

| OPTION   | DESCRIPTION                                                 |
|----------|-------------------------------------------------------------|
| GENERATE | -----GENERATE ANY ARIMA TIME SERIES                         |
| AUTO     | -----CALCULATE AUTOCORRELATIONS, PAUTOS, MEAN AND VARIANCE  |
| PLOT     | -----PLOT A TIME SERIES                                     |
| ESTIMATE | -----CALCULATE MAX LIKELIHOOD ESTIMATES OF ARMA PARAMETERS  |
| DIFF     | -----DIFFERENCE A TIME SERIES                               |
| FORECAST | -----FORECAST FUTURE VALUES, CONSTRUCT CONFIDENCE INTERVALS |
| TRANS    | -----TRANSFORMS VALUES OF A TIME SERIES                     |
| ROOTS    | -----DETERMINES ROOTS OF ARIMA CHARACTERISTIC EQUATION      |
| ZFORMAT  | -----ALTER DATA FILE TO FORMAT 5F15.6                       |
| CMSWORK  | -----PERFORM CP/CMS COMMANDS IN TIMESER EXEC                |
| SIMULATE | -----SIMULATE NONSEASONAL TIME SERIES                       |
| YESTSEAS | -----CALCULATE INITIAL SEASONAL PARAMETERS                  |
| MARQRT   | -----MARQUARDT SOLUTION FOR PARAMETER ESTIMATES             |
| XSUMSQ   | -----CALCULATE SUM OF SQUARES FOR ARBITRARY PARAMETERS      |

WOULD YOU LIKE MORE INFO?  
Y

ENTER OPTION YOU WANT INFO ABOUT.

a

AUTO -----THIS PROGRAM CALCULATES AUTOCORRELATIONS, PARTIAL  
AUTOCORRELATIONS, THE MEAN AND THE VARIANCE FOR A GIVEN TIME SERIES  
WHICH MUST RESIDE IN FILE FT02F001. THE PROGRAM USES  
FTAUTO IN THE IMSL LIBRARY. THE AUTOCORRELATIONS AND PAUTOS CAN BE  
PLOTTED OFFLINE.

DO YOU WANT INFO ABOUT ANOTHER OPTION?

n

DO YOU WANT TO TRY A SESSION?

y

ENTER LETTER FOR OPTION YOU WANT.

c

ENTER DESIRED CP/CMS COMMANDS, ONE PER LINE.

WHEN FINISHED TYPE: &GOTO -QUES

listf \* ft02f001

FILENAME FILETYPE MODE NO.REC. DATE

SERG FT02F001 P1 3 9/16

SERC FT02F001 P1 5 9/16

LNSERG FT02F001 P1 3 9/16

FILE FT02F001 P1 1 9/16

erase file ft02f001

alter serc ft02f001 pl file ft02f001 pl

stat

P (191): 28 FILES; 240 REC IN USE, 56 LEFT (of 296), 81% FULL (2 CYL)

&goto -ques

DO YOU WANT TO GO AGAIN?

y

ENTER LETTER FOR OPTION YOU WANT.

a

IS YOUR DATA IN FILE FT02F001?

y

EXECUTION BEGINS...

AUTOCORRELATIONS

|        |        |        |        |        |       |       |       |       |        |
|--------|--------|--------|--------|--------|-------|-------|-------|-------|--------|
| 0.978  | 0.944  | 0.902  | 0.854  | 0.802  | 0.748 | 0.692 | 0.635 | 0.579 | 0.923  |
| 0.468  | 0.413  | 0.359  | 0.305  | 0.253  | 0.201 | 0.150 | 0.098 | 0.047 | -0.003 |
| -0.052 | -0.101 | -0.151 | -0.200 | -0.248 |       |       |       |       |        |

PARTIAL AUTOCORRELATIONS

|        |        |        |        |        |        |        |        |        |        |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0.978  | -0.260 | -0.157 | -0.093 | -0.058 | -0.045 | -0.012 | -0.038 | -0.022 | -0.010 |
| -0.036 | -0.041 | -0.038 | -0.024 | -0.037 | -0.027 | -0.032 | -0.070 | -0.048 | -0.024 |
| -0.034 | -0.061 | -0.079 | -0.048 | -0.037 |        |        |        |        |        |

MEAN= 22.9739

VARIANCE = 4.22273

ENTER TITLE FOR PLOTS.

autos and pautos for series c data

YOUR AUTO AND PAUTO PLOTS HAVE BEEN PRINTED OFFLINE.

PICK UP IN ROOM 1140 UNDER YOUR USER ID NUMBER.

DO YOU WANT TO GO AGAIN?

y

ENTER LETTER FOR OPTION YOU WANT.

c

ENTER DESIRED CP/CMS COMMANDS, ONE PER LINE.

WHEN FINISHED TYPE: &GOTO -QUES

offline print file ft02f001

alter file ft02f001 pl serc ft02f001 pl

&goto -ques

DO YOU WANT TO GO AGAIN?

n

CONTROL RETURNED TO CMS

R;

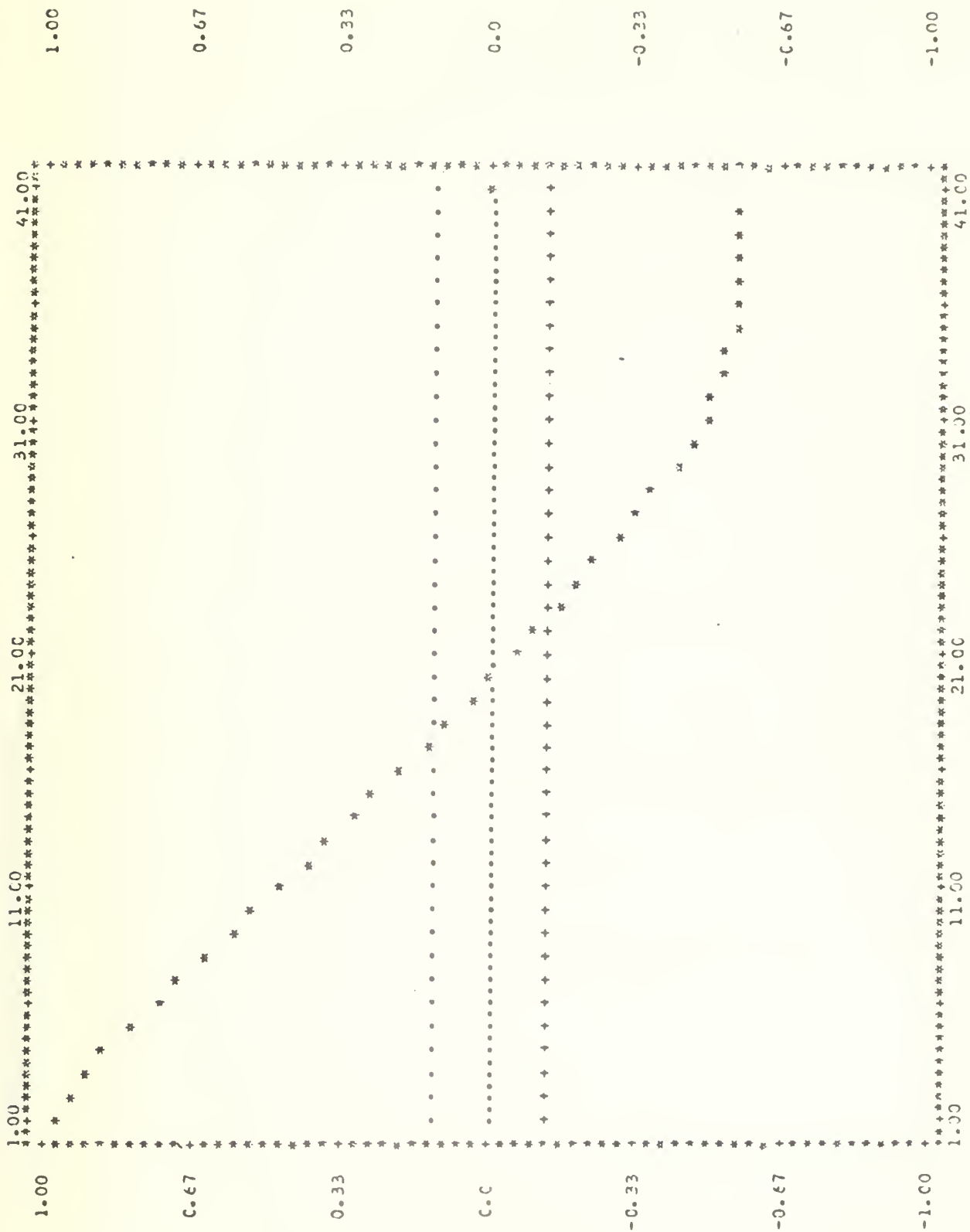


| AUTOCORRELATIONS         |        |        |        |        |        |        |        |        |  |
|--------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--|
| 0.578                    | 0.944  | 0.502  | 0.854  | 0.902  | 0.748  | 0.635  | 0.573  | 0.523  |  |
| 0.468                    | 0.413  | 0.353  | 0.305  | 0.253  | 0.201  | 0.150  | 0.097  | 0.043  |  |
| -0.052                   | -0.101 | -0.151 | -0.200 | -0.248 | -0.294 | -0.337 | -0.379 | -0.418 |  |
| -0.486                   | -0.512 | -0.534 | -0.550 | -0.562 | -0.570 | -0.573 | -0.573 | -0.568 |  |
| PARTIAL AUTOCORRELATIONS |        |        |        |        |        |        |        |        |  |
| 0.578                    | -0.260 | -0.157 | -0.093 | -0.058 | -0.045 | -0.012 | -0.038 | -0.022 |  |
| -0.036                   | -0.041 | -0.038 | -0.024 | -0.037 | -0.027 | -0.032 | -0.070 | -0.078 |  |
| -0.034                   | -0.061 | -0.079 | -0.048 | -0.037 | -0.011 | -0.031 | -0.054 | -0.036 |  |
| -0.002                   | 0.022  | -0.014 | -0.006 | -0.024 | 0.006  | -0.016 | -0.004 | -0.010 |  |

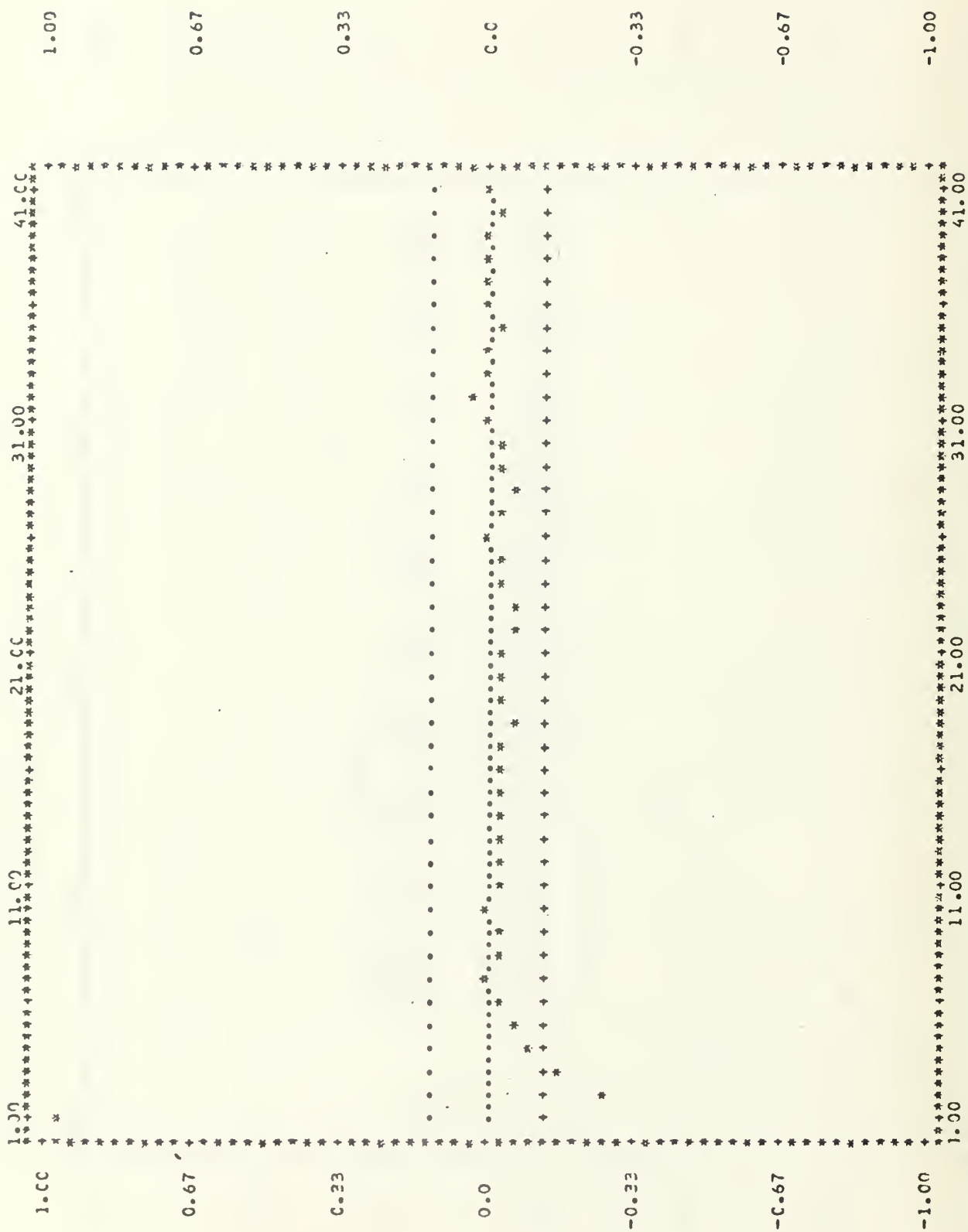
MEAN = 22.9739

VARIANCE = 4.22273





AUTOCORRELATIONS WITH 2 SIGMA BANDS.



PARTIAL AUTOCCORRELATIONS WITH 2 SIGMA BANDS •  
 AUTOS AND PAUTOS FOR SERIES C DATA

226

FT02F001 P1

[illegible][illegible][illegible]
$$Z$$

Q.

[illegible]

5

[illegible]

## V. PROBLEM CONTROL NOTES

This section will cover corrective measures that can be taken when things fail to go as expected while in the TIMESER environment.

a. A typing error in the CMS environment can be corrected by typing the @ character as many times as is required to back up and then type the correct values. For example, if the user typed timesre, the user could correct the mistake by typing two @ signs, followed by the correct spelling er, as follows: timesre@@re. An entire line can be deleted by typing the ¢ character (or [ on some terminals).

b. When working with TIMESER executive programs, the user should exercise care before hitting the return key (or control s on some terminals). If an input value is required and the return key is hit before the proper response is entered, the user will be likely to get thrown out of the editor and have to begin again. In most cases, errors can be corrected only before the return key is struck (in some programs you get a second chance for input).

c. Particular care should be taken for integer value input, which must be right justified in the format field. The editor will advise the user in all cases where the integer format is other than I1.

d. If for any reason the user finds himself in a debug or error condition (caused by erroneous data, or a "blowup" in one of the non-linear optimization routines usually

caused by very poor initial input values), the following procedure will get the user back into the normal TIMESER environment:

- (1) depress the ATTN key twice; this gets the user into CP; hit the ATTN key again, and then type kx to kill the execution.
- (2) re-ipl CMS, and login 191 and then login 192 t,p.
- (3) then the user can type TIMESER or TIMESER S, and return to the TIMESER environment

On the next page is a sample user session where an error causing a debug condition has occurred.

Here the user executed a program that required data in FILE FT02F001, and the FILE did not exist. As the example shows, recovery is quick. Simply hit the break button to get into CP, login 191, login 192 t,p, and then type timeser s to return immediately to the Editor environment.

ENTER LETTER FOR OPTION YOU WANT.

d

EXECUTION BEGINS...

IHC218I FIOCS - I/O ERROR BSAM INPUT ERROR 01 ON FILE: "FT02F001"

8

TRACEBACK ROUTINE CALLED FROM ISN REG. 14 REG. 15 REG. 0 REG. 1

IBCOM

000131FC 000133F8 FFF93908 00014F80

DIFF

CP

ipl cms

CMS Version 3.25

login 191

R;

login 192 t,p

T (192) R/O

R;

timeser s

ENTER LETTER FOR OPTION YOU WANT.

c

ENTER DESIRED CP/CMS COMMANDS, ONE PER LINE.

WHEN FINISHED TYPE: &GOTO -QUES

alter serc ft02f001 pl file ft02f001 pl

&goto -ques

DO YOU WANT TO GO AGAIN?

y

ENTER LETTER FOR OPTION YOU WANT.

d

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